greater at high temperatures than at low ones, because the corrosion itself produced heat.

A considerable deficiency of deposited copper, sometimes amounting to 18 per cent., may result by ordinary chemical corrosion through employing a hot solution. This fact is worthy of consideration in the electro deposition of copper for commercial purposes.

The greatest obstacle to finding the electro-chemical equivalent of copper was the difficulty of determining how much the ordinary chemical corrosion was decreased at the anode or increased at the cathode by the electric current, and the next greatest obstacle was the disintegration of the anode, and the dissolving of the powder by chemical action. Notwithstanding that the cathode is more corroded by purely chemical action than the anode, the gain of weight of the former is the least inaccurate, because of the unavoidable disintegration of the anode. Substantially the method does not admit of a great degree of accuracy, because the chemical corrosion of copper, even in a cold neutral solution of cupric sulphate, causes a loss of that metal, and prevents the true weight being obtained. The correction cannot be accurately, but may be approximately, found, by using a comparison sheet of copper in the same liquid without a current. The corrosion of such a sheet is, however, somewhat less than that of the cathode. The nearest approach to the true number appears to be obtained by using a cold neutral solution, small narrow horizontal electrodes, and rapid deposition without stirring, continued during only a short period of time.

No signs were observed in any of the experiments of ordinary electric conduction unattended by electrolysis.

The results of this research also afford information respecting the degree of accuracy of the method of measuring by means of electrolysis of a solution of cupric sulphate, the amount of electric current consumed in electric lighting, and states the conditions under which the degree of inaccuracy of such a method of measurement is the least. It is a remarkable circumstance that an electric current entering a copper cathode from a strong mixture of sulphuric acid and water, instead of protecting the copper, actually increases its chemical corrosion; by what means it does this is now being investigated by the author.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The examiners for the Burdett-Coutts Geological Scholarship have recommended for election Mr. G. A. Buckmaster, B.A., of Magdalen College. Mr. R. Chalmers, B.A., of Oriel, also distinguished himself in the examination. The scholarship is tenable for two years.

CAMBRIDGE.—Notice has been given that one of the Cambridge local examinations will be held in September next, commencing on Monday, 4. This is, partly, for the convenience of students who desire to pass a preliminary examination required by the General Medical Council previous to registration as medical students. Many students used to resort to the College of Surgeons for this purpose, but the College has ceased to hold such an examination, and it is at the instance of the Medical Council that a local examination is to be held in September for the accommodation of the medical students. The examination is also intended to enable students who intend entering the University in October to obtain, before going up to Cambridge, the certificates which will excuse them from the previous examination of the University. They will find it a considerable advantage to do this, for, in addition to the time so gained, having gone through the required test of school education through the local examination in September, they will be able at the beginning of the October term to join the classes of the several professors (of natural science, medicine, and others) at the commencement of the several courses. Hitherto many passed the previous examination in December, and many at a later period. Now the arrangements are such that all have the opportunity, through the Oxford and Cambridge Schools Board Examination in June, or through the local examination in September, of obtaining certificates which will wholly, or partly, exempt them from the previous examination; and it is obvious that those who take the advantage of this opportunity will have the start of their fellows in the University race. The September examination will be held on September 4, in Cambridge and London, and other places in which there may be sufficient candidates. The requisite forms to be filled up and sent in before August 1, may be obtained, with other information, for Cambridge, from Rev. G. F. Browne, St. Katharine's College; and for London, from Mr. R. Sc. I. Corbet, 10, Portman Street, London, W.

PROF. HUMPHRY announces that Mr. Donald McAlister will give a course of lectures on the Mechanics of the Human Skeleton in the Easter Term, beginning on Wednesday, April 26.

THE Cambridge University Natural Science Club celebrated the tenth anniversary of their foundation by holding a dinner in the hall of Downing College (kindly granted for the occasion) on March 11. Dr. Michael Foster, Sec.R.S., occupied the chair, and there was a large gathering of old and present members and their friends. It is worthy of note that seven Professorial chairs in science and ten Fellowships, besides other dignities, are at present occupied by former members of the Club in the short time that has existed since its foundation.

VICTORIA UNIVERSITY.—The Council have appointed the following as external examiners of the University:—In Classics, the Rev. R. Burn, M.A., Fellow of Trinity College, Cambridge; In English Language and Literature, Mr. T. C. Snow, M.A., Fellow of St. John's College, Oxford; in French, M. E. Joël, Mason College, Birmingham; in German, Prof. C. A. Buchheim; in Philosophy, Mr. James Sully, M.A.; in Political Economy, Mr. W. H. Brewer, M.A.; in Mathematics, Mr. John Hopkinson, M.A., D.Sc., F.R.S.; in Engineering, Mr. John Hopkinson, M.A., D.Sc., F.R.S.; in Physics, Prof. A. W. Rucker, M.A.; in Chemistry, Prof. H. E. Armstrong, F.R.S.; in Physiology, Mr. J. Langley, M.A., Fellow of Trinity College, Cambridge; in Zoology, Mr. Patrick Geddes, Demonstrator in Botany in the University of Edinburgh; in Botany, Mr. S. H. Vines, M.A., D.Sc., Fellow of Christ's College, Cambridge; in Geology and Palæontology, Prof. T. Rupert Jones, F.R.S.

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, February 12.—Prof. W. Flower, LL.D., F.R.S., president, in the chair.—Mr. F. Moore read a paper containing an account of the Lepidoptera collected by the Rev. J. H. Hocking, chiefly in the Kangra district, North-west Himalaya, with descriptions of new genera and species.—A communication was read from Mr. G. A. Boulenger, C.M.Z.S., in which he gave the description of a Frog (*Phyllomedusa hypochondrialis*) lately living in the Society's Gardens. This Frog had been obtained at Pernambuco, and was believed to be the first example of the species that had reached Europe alive. Attention was drawn to the peculiar coloration, as being worthy of notice, it not having been described before.—Mr. Oldfield Thomas read a paper containing the descriptions of a small collection of Rodents which had been obtained by the late Mr. B. J. Andersson in Damara Land and in the neighbouring countries. The collection contained examples of a new species of Mouse, which was proposed to be named *Mus nigricauda*.—Mr. W. A. Forbes gave a description of the pterylosis of *Mesites*, and made some remarks on the position of that genus, which he considered to be most nearly allied to *Rhinochetus* and *Eurypyga*, though all these three forms should be referred to different families.—Prof. St. George Mivart read a series of notes on the anatomy of the Canada Porcupine (*Erithizon dorsatus*).

Chemical Society, March 2.—Prof. Roscoe, president, in the chair.—The following papers were read:—On the action of aldehydes on phenanthraquinone in presence of ammonia (third notice), by F. R. Japp and F. W. Streatfeild. With aldehydes of the benzene series and furfuraldehyde, compounds belonging to the class of substances obtained by Ladenburg (*Ber.* ix. 1524) were obtained; with hydroxyaldehydes of the benzene series, compounds of the character of the anhydrobases described by Hübner were formed; with the methyl ether of salicylaldehyde a mixture of both the above bodies is obtained. The authors conclude that the above reactions are most readily accounted for on the assumption that phenanthraquinone has the peroxide constitution ascribed to it by Graebe.—Application of the aldehyde and ammonia reaction in determining the constitution of quinones, by F. R. Japp and F. W. Streatfeild. The authors state that the occurrence of this reaction and the formation of compounds resembling those above described, may be taken as a proof of the ortho position in quinones.—On the solubility of glass in certain reagents, by R. Cowper. The author has determined the quantity of matter dissolved out of glass by ammonium sulphide and ammonium hydrate; dilute solutions have more action than the concentrated reagents.—Analysis of a piece of oxidised iron from the condenser of H.M.S. *Spartan*, by R. Cowper. This contained no metallic iron, but 42·33 per cent. of ferrous oxide, 2·21 per cent. of ferric oxide, 5·24 per cent. phosphoric acid, 2 per cent. chlorine, and 16·71 per cent. water. Under ordinary circumstances iron rust is chiefly composed of ferric oxide.—On the action of sodium hydrate and carbonate on felspars and Wollastonite, by W. Flight. The hydrate acts powerfully as a solvent, but the strongest solutions of the carbonate have but little action.—On the preparation of pure nitrogen, by W. Flight. The author finds that ferrous oxide, freshly precipitated by adding caustic potash to ferrous sulphate solution, completely deprives ordinary air of oxygen; potassium pyrogallate and other reagents do not remove the last traces of oxygen.—Some observations on the luminous incomplete combustion of ether and other organic substances, by W. H. Perkin. When, in the dark, a jet of ether is blown from a wash-bottle on to an iron plate at a dull red heat, a lambent blue flame is observed, the temperature of which is so low that it does not char paper; a similar flame is seen when a heated iron ball is suspended over a dish of ether. Sir H. Davy, Doebereiner, and Boutigny, have noticed this phenomenon. Spermaceti, when melted over a hot iron ball shows a similar phenomenon. Paraffin, alcohol, &c., also give a blue flame when treated as above.

Mathematical Society, March 9.—S. Roberts, F.R.S., president, in the chair.—Mr. A. Buchheim, B.A., Scholar of New College, Oxford, was elected a Member.—The following communications were made:—In how many ways can a polygon of $2n$ sides be divided into quadrilaterals by means of non-intersecting diagonals with an extension to the general case of division into p-gons? Prof. Rowe.—Systems of formulæ for the sn, cn, dn of $u+v+w$, Prof. W. Woolsey Johnson (communicated by J. W. L. Glaisher, F.R.S.).—Remarks on the preceding paper, and on elliptic function formulæ, Rev. M. M. U. Wilkinson.—Two notes, Mr. C. E. Bickmore.—Note of proofs of the addition theorem for the second integral, and Fagnani's theorem by confocal conics, J. J. Walker.

Linnean Society, March 2.—Sir J. Lubbock, Bart., F.R.S., in the chair.—The following gentlemen were elected Fellows of the Society, viz.:—Col. R. H. Beddome, T. B. Chambers, Rev. W. H. Dallinger, C. D. Ekman, W. Fream, Rev. R. Hooper, C. Dubois Larbalestier, Rev. R. P. Murray, and R. Vipan.—Prof. P. M. Duncan showed an example of the pollen-tube of *Crocus sativa*, and he explained his views thereon.—Mr. Chas. Stewart also exhibited sections of the ovule of *Crocus*, and Mr. C. Fred. White likewise exhibited a series of drawings of the pollen of various plants.—D. T. Spencer Cobbold called attention to drawings of the pollen-tubes of *Portulaca oleracea*, &c., received from Mr. Krutschnitt, of New Orleans, U.S.—A paper on the structure and habits of the coal-reef annelid *Palolo viridis*, by the Rev. Thomas Powell, was read; the information regarding its periodic visits to Samoa and Fiti being of considerable interest.—Contributions to the Lichenographia of New South Wales, by Chas. Knight, was also read, some fifty new species of Lichens being described.—Mr. A. G. Butler gave a communication on the butterflies collected by Lord Walsingham in California; and Mr. R. B. Sharpes' seventh contribution to the ornithology of New Guinea, and a description of a new species of sand-martin (*Cotile*) from Madagascar, were read.—There followed a description of a new genus (*Microgale*), and two new species of Insectivora from Madagascar, by Mr. Oldfield Thomas.

Anthropological Institute, February 21.—Edward B. Tylor, F.R.S., vice-president, in the chair.—The election of W. Crowder was announced.—Mr. J. E. Price read a note on Aggri beads. These beads are occasionally dug up on the Gold Coast, and sell for more than their weight in gold, being among the most valued of royal jewels. They have been found in various parts of England, some of those exhibited having been obtained from Colchester, where they were found associated with human remains, whilst others were discovered during the recent alterations at Leadenhall Market. The author thought that the appearance of these beads in England might be accounted for by the fact, that when the Romans occupied the country they brought with them many African slaves who wore necklaces with Aggri beads attached, and that when these slaves died their necklaces were buried with them.—Dr. Macfarlane read a paper on the analysis of the relationships of consanguinity and marriage; and in the absence of the authors the director read a paper entitled from Mother-right to Father-right, by Mr. A. W. Howitt and the Rev. Lorimer Fison.

Geological Society, February 22.—J. W. Hulke, F.R.S., president, in the chair.—Richard Kerr, Baron Ferd. von Müller, K.C.M.G., M.D., Ph.D., F.R.S., William Whitehead Watts, and Joseph Wilkinson, were elected Fellows of the Society.—The following communications were read:—Additional discoveries of high-level marine drifts in North Wales, with remarks on driftless areas, by D. Mackintosh, F.G.S.—On some sections of Lincolnshire Neocomian, by H. Keeping, of the Woodwardian Museum, Cambridge, communicated by W. Keeping, F.G.S.—Notes on the geology of the Cheviot Hills (English side), by C. T. Clough, F.G.S.

Physical Society, March 11.—Prof. Fuller in the chair.—New Member, Mr. D. Reece Jones.—Mr. Newth showed some experiments illustrative of the fact announced by M. Mascart in 1875, that solid particles in the air are necessary to the formation of fogs; and secondly, that certain gases, such as sulphurous acid gas, also cause fogs in the same way, by permitting the moisture to condense upon these particles. The experiments consisted in passing an electric light beam through large bulbs of glass containing air and a small quantity of water. When the air in the bulbs was washed with the water, and thus freed from motes, the fog produced in the bulb by slightly exhausting it with an air-pump was much less than when the air of the room, or smoke, or sulphurous acid gas, was admitted into the bulb. The dust on a platinum wire, rendered incandescent within the globe by an electric current, also caused a sensible fog. It follows that with gas fires instead of coal, there would still be fogs, though not so black ones.—Prof. F. Guthrie, F.R.S., read a paper on the discharge of electricity by heat. This was concerned with additional experiments to those made by the author on the subject nine years ago. He showed by means of a gold leaf electroscope that a red-hot iron ball, when highly heated, would neither discharge the positive prime conductor of a glass electrical machine nor the negative one, but on cooling the ball a temperature was found at which the ball discharged the negative conductor, but not the positive one. Lastly, on cooling the ball still further (but not below a glowing temperature) it was found to discharge both positive and negative electricity. A platinum wire rendered red hot by the current also discharged a negatively-charged electroscope more readily than a positively charged one. When placed between two electroscopes, one having a + and the other a − charge, it discharged neither. When the + one was withdrawn the − was discharged; but when the − was withdrawn the + was not discharged. There therefore seemed a tendency in a hot body to throw out + rather than − electricity. That a material medium between the heated body and the electrified one was necessary, was shown by the failure of the experiment with a Maxim incandescent lamp consisting of a carbon filament in a vacuous bulb. Dr. Guthrie also showed the demagnetisation of a small magnet in the heat of a Bunsen flame by inserting it in a coil of wire connected to a mirror galvanometer and heating it in the flame. He also showed that the pole of a voltaic battery could be discharged by heating it red hot. This was done by connecting a piece of fine platinum wire to one pole and heating it in the flame of a spirit lamp, care being taken to insulate the lamp to prevent conduction to earth. The discharge was shown by means of a mirror electrometer.

Entomological Society, March 1.—Mr. H. T. Stainton, F.R.S., president, in the chair.—Mr. T. R. Billups exhibited queens of *Vespa germanica*, taken on the wing on January last, and specimens of *Callistus lunatus* and *Ichneumon erythræus*.—Mr. R. McLachlan showed papers in which butterflies had been received from Borneo, bearing an unusually distinct imprint of the inclosed insect.—Messrs. Meldola and Cowan called attention to the assembling of butterflies round pupæ.—Mr. E. A. Fitch exhibited some eggs of Entozoa.—Papers read:—Mr. C. O. Waterhouse, a description of *Paramellon sociale*, a new genus and species of Myrmecophilous Coleopteron from India.—Dr. D. Sharp, on some New Zealand *Coleoptera*.—Mr. A. G. Butler, additional notes on *Bombyces* collected in Chili by Mr. T. Edmonds.—Mr. E. Saunders on the abdominal segments in aculeate *Hymenoptera*, and Sir S. S. Saunders on those in the *Chalcididæ*.

EDINBURGH

Royal Society, February 20.—Prof. Maclagan, vice-president, in the chair.—Prof. Turner read a paper on a specimen of *Balænoptera borealis* or *laticeps*, which was captured in 1872 at Boness, on the Firth of Forth. Comparing this species with the other three species of Balænoptera, the author noted how highly characteristic of each were the number of vertebræ and the appearance of the whalebone. The skull, ribs, and other bones of the present specimen were of a peculiarly smooth texture as compared, for example, with those of *Balænoptera Sibbaldii*—indicating probably a less amount of oil in the bones of the former. The hyoid bone was particularly referred to as of a highly characteristic form.—Prof. Tait communicated a quaternion note by M. Gustav Plarr, on Minding's theorem.—Prof. Heddle presented chapter vii. of his chapters on the mineralogy of Scotland, dealing in the present instance with the ores of manganese, iron, chromium, and titanium. Two new ores of iron were described.—Prof. Tait communicated a paper by Mr. W. J. Millar, C.E., on the dimensions of cast iron at various temperatures, the greatest novelty in which seemed to be the conclusion, based on careful experiment, that the coefficient of linear dilatation of iron diminishes markedly with rise of temperature.—Mr. M. M. Pattison Muir, M.A., in a short chemical note, gave the properties of an oxycyanide of bismuth, and recorded the discovery of a new oxide, which he called the hypobismuthic oxide.—Mr. T. B. Sprague communicated an extremely neat and complete graphical representation of the well-known theorem, due to Cauchy, relating to the number of roots in an equation of the nth degree.—Dr. R. S. Marsden supplemented his former communication on the function of carbon in steel by a short paper on the influence of silicon (which behaves somewhat similarly to carbon), phosphorus, manganese, and other elements.

PARIS

Academy of Sciences, March 6.—M. Blanchard in the chair.—The following papers were read:—On the normal carbonic acid of atmospheric air, by M. Dumas. After noticing the defects of several methods of measurement, he commends the exactness of M. Reiset's, and accepts his result, that about 3 vol. in 10,000 represents the general (little varying) ratio of CO_2 in air. The variations through great movements of the atmosphere now require study, by observers placed at many different and distant stations, and the transit expeditions should keep this in view. MM. Müntz and Aubin's methods are most suitable for this.—On some applications of the theory of elliptic functions, by M. Hermite.—Experiments on a Faure secondary battery, by MM. Allard, Le Blanc, Jaubert, Potier, and Tresca. The charging of the battery (formed of thirty-five elements, new model) required a total mechanical work of 1558 horse-power during 22h. 45m., or 1 horse-power during 35h. 26m. The battery really received only 0·66 of this work. 60 per cent. of the work of 6,382,100 kgm. thus stored was recovered in discharge (Maxim lamps being used). The use of the accumulator thus cost 0·40 of the work furnished by the dynamo. This loss would in many cases be outweighed by advantages.—On the double decompositions of haloid salts of mercury by hydracids and by haloid salts of potassium, by M. Berthelot.—On the formation of two dibasic acids, sebacic and suberic, in distillation of crude fatty acids by means of a current of superheated steam, by MM. Cahors and Demarçay.—Experimental studies on the action of permanganate of potash on poisons, forms of virus, and zymotic diseases, by M. Vulpian. The method can only be efficacious, he thinks, when the bite is very recent; in one hour, or more it must be useless, the permanganate (in the dose recommended) being unable to overtake the poison, and being soon decomposed. Intravenous injection of an efficacious dose of permanganate would be fatal.—Memoir on the generation and regeneration of the bone of caducous and persistent horns of Ruminants, by MM. Robin and Herrmann. They controvert the view that in the present case there is an exceptional form of osteogenesis, viz. *metaplastic* ossification, or direct transformation of cartilage into bone.—New pump for compression of gases, by M. Cailletet. A special feature is the presence of mercury above a plunger piston, with which the mercury moves. An hour's work will give 400 or 500 gr. of liquid carbonic acid or protoxide of nitrogen. The author stores compressed gases in bundles of metallic tubes communicating with each other, and each holding about four litres. Pressures of several hundred atmospheres are attained. The movement of the mercury in the pump counteracts heating.—Quick method of determining the density of gases, by M. Chancel. This depends (like M. Dumas' method for vapours) on displacement of the air of a spherical glass vessel by the gas whose density is to be measured, and which enters by a lateral tubulure in the neck, passing thence down a bent tube (soldered to the hollow stopper), which opens near the bottom of the vessel. At the proper time the stopper is turned, the supply tube (caoutchouc) detached, a cock above the stopper closed, and the vessel weighed.—M. Villarceau made some remarks in presenting a memoir on the methods of Wronski in celestial mechanics.—On rules to be followed in hypnotisation of hysterical persons, by MM. Dumontpallier and Magnin. This relates to the ways of producing each of the periods of hypnotism. To make a state disappear, one should use the same agent as produced it.—On the determination of the genus of an entire transcendental function, by M. Laguerre.—On the law of deviation of Foucault's pendulum, by M. Hatt.—On the compressibility of gases, by M. Sarran. He seeks to verify a relation given by Clausius, for other gases than carbonic acid.—On a vibratory movement in production of a steam jet, by M. Vautier. A plate placed across the jet at a certain height is repelled; but if lowered parallel to itself, it is attracted, and at about 0·2 mm. from the orifice it oscillates, with sound.—Hydrodynamic experiments (third note); direct imitation, with liquid currents, of the actions of electric currents on each other, by M. Decharme.—On the retrogradation produced by the electric *effluve* in transformation of oxygen into ozone, by MM. Hautefeuille and Chappuis. This change of ozone into oxygen is due to liberation of heat, accompanying the spontaneous destruction of ozone raised to a high temperature by the effluve; it occurs only at low pressures of oxygen.—On some phosphates neutral to litmus, by MM. Filhol and Lenderens.—On an isomer of orcine, lutorcine, by MM. Vogt and Henninger.—On the soluble and insoluble modifications of the ferment of gastric digestion, by M. Gautier.—Division of embryonal cells in Vertebrates, by M. Henneguy. These observations were on the ova of trout.—On the circulatory apparatus of starfishes, by MM. E. and J. Perrier.—On some types of Cestodes, by M. Moniez.—On the organisation of the mouth of *Dochmius* or *Ankylostomas*, *apropos* of parasites of these two genera found in the dog, by M. Magnin.—Diabetic endocarditis, by M. Lecorché.—Ophitic rocks in the Pyrenees; ages; relations with saliferous substances; origin, by M. Dieulafait.—Variations of temperature with altitude in the valley of the Seine during the period of high pressures in January, by MM. Lemoine and de Tréandeau.—A geological map of the Loire valley (scale $\frac{1}{400000}$), by M. Grüner, was presented.

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